

Applicant : Todd P. Oman et al.
Appln. No. : 10/623,783
Page : 6

REMARKS

By way of this amendment, claims 1, 8 and 15 have been amended to include the limitations previously found in claims 4, 22 and 17, respectively. Claims 4, 17 and 22 are now cancelled. Accordingly, claims 1-3, 5-16, 18-21 and 23 remain present in this application. Applicants respectfully request reconsideration and allowance of the present application.

In the latest Office Action, claims 1-5, 7, 15-18, 20, 21 and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over the structure shown by Applicants in FIG. 1 in view of Yoshikawa (U.S. Patent No. 6,046,498). In order to expedite allowance of the application, independent claims 1, 8 and 15 have been amended to include the limitations previously considered in claims 4, 22 and 17, respectively. Applicants submit that the claims, as amended, would not have been rendered obvious under 35 U.S.C. §103(a) for the reasons discussed below.

Applicants' FIG. 1 illustrates a typical prior art electronic module having reliability problems that can result in failure of solder joints. The Yoshikawa patent discloses a device having a heat sink for cooling an integrated circuit which, in FIG. 7, illustrates a multi-chip cooling structure in which the thermal conduction blocks contain a hemispherical portion.

In contrast, Applicants' claimed invention is directed to a thermally enhanced electronic module having a thermally conductive case, a self-aligning thermally conductive heat sink, and a die. The case includes a substantially semi-spherical pivot area with a first shape formed into the case for receiving a first portion of the heat sink. Additionally, the first portion of the heat sink has a second shape that is complimentary to the first shape. The die has a first surface and a second surface opposite the first surface. The die is mounted to a substrate with the first surface of the die facing the substrate. The second surface of the die is in thermal contact with the heat sink. In claim 1, as amended, one of a thermally conductive grease and a thermally conductive adhesive is located between the case and the heat sink. In claim 8, as amended, the module further includes an elastomer member disposed between the substrate and the thermally conductive metal case. The method claim 15, as amended, recites a method of manufacturing a thermally enhanced electronic module that includes the steps of forming a substantially semi-

Applicant : Todd P. Oman et al.
Appln. No. : 10/623,783
Page : 7

spherical pivot area and providing one of a thermally conductive grease and a thermally conductive adhesive between the case and the heat sink.

There is no teaching or suggestion in Applicants' specification as shown in FIG. 1 to provide a substantially semi-spherical pivot area in a thermally conductive case, with the pivot area having a first shape formed into the case for receiving a first portion of a self-aligning thermally conductive heat sink, and wherein the first portion of the heat sink has a second shape that is complimentary to the first shape, further combined with either of one of a thermally conductive grease and a thermally conductive adhesive located between the case and the heat sink or an elastomer member disposed between the substrate and the thermally conductive metal case. The Yoshikawa patent merely shows the semi-spherical shaped interface between the chip and the heat sink, but does not teach or even suggest such a configuration in combination with one of a thermally conductive grease and the thermally conductive adhesive located between the case and the heat sink. Instead, the Yoshikawa patent discloses a solder 500 at the interface which provides for a much less compliant rigid connection. Additionally, Yoshikawa lacks any teaching or suggestion to use an elastomeric member disposed between the substrate and the thermally conductive metal case.

Accordingly, Applicants submit that independent claims 1, 8 and 15, as amended, and the claims dependent thereon would not have been rendered obvious to one of ordinary skill in the art at the time of Applicants' invention in view of Applicants' FIG. 1 and the Yoshikawa patent, and the rejection of these claims under 35 U.S.C. §103(a) should therefore be withdrawn, which action is respectfully solicited.

Additionally, claims 6, 8-14, 19 and 22 were also rejected under 35 U.S.C. §103(a) as being unpatentable over Applicants' FIG. 1, in combination with the Yoshikawa patent. Applicants likewise submit that these claims are dependent upon independent claims 1, 8 and 15, and should therefore be allowable for the reasons set forth above with respect to the rejection of the independent claims.

By way of foregoing amendments and discussion, Applicants have demonstrated that the claims, as amended, would not have been rendered obvious in view of Applicants' FIG. 1

Applicant : Todd P. Oman et al.
Appln. No. : 10/623,783
Page : 8

in combination with the Yoshikawa patent, and the rejection of the claims under 35 U.S.C. §103(a) should therefore be withdrawn.

In view of the above amendments and remarks, it is submitted that claims 1-3, 5-16, 18-21 and 23 define patentable subject matter and are in condition for allowance, which action is respectfully solicited. If the Examiner has any questions regarding the patentability of any of the claims, the Examiner is encouraged to contact Applicants' undersigned attorney at the Examiner's convenience.

Respectfully submitted,

September 28, 2005
Date

A handwritten signature in black ink, reading "Kevin T. Grzelak". The signature is written in a cursive, flowing style. The first name "Kevin" is written in a larger, more prominent script, followed by "T." and "Grzelak". The signature is positioned above a horizontal line.

Kevin T. Grzelak, Registration No. 35 169
Price, Heneveld, Cooper, Dewitt & Litton, LLP
695 Kenmoor, S.E.
Post Office Box 2567
Grand Rapids, Michigan 49501
(616) 949-9610

KTG/jrb